Taking a Bite Out of Consumer Food Waste in Des Moines, Iowa

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Abstract

In America, 40% of the food produced is ultimately thrown away, which is economically and environmentally detrimental. Our essay outlines the issue from a national standpoint to the local level, providing an examination of programs developed in other cities across the nation and the current programs in Des Moines that combat the food waste problem. This research reveals that there is a lack of education provided for the primary producers of food waste: individual consumers. We conducted a survey on 200 residents of the Des Moines metro area and found that this demographic would like more information on Use By and Sell By dates, as well as proper food storage for a variety of foods. Based on these results, we have developed some simple educational materials that can be easily distributed through existing organizations to educate the consumers on the topics they are curious about. Combating food waste needs to be a community activity, requiring participation and cooperation from an array of organizations. As such, we have developed a sample proposal that will be used by Next Course, a Food Recovery Network organization, to create partnerships with restaurants and grocery stores in the fight against food waste in Des Moines.

Keywords: Food Waste, Des Moines, Next Course, Composting, Landfills

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Introduction

The United States Department of Agriculture's Economic Research Service defines *food waste* as, "the amount of edible food, postharvest, that is available for human consumption that is not consumed for any reason." To put it simply, the term *food waste* refers to food that is produced but not used. According to the National Resource Defense Council (NRDC), about 40% of all food produced in the United States ends up in landfills (IWRC, 2015). This means that just under half of the amount of food produced in our country ultimately becomes food waste.

That shocking statistic is significant in several ways, especially when one considers the reality of hunger. Hunger is a global issue: between 2010 and 2012 almost 870 million people suffered from chronic undernourishment. According to the United Nations Food and Agriculture Organization (FAO) the majority of these people live in developing countries, while about 16 million live in developed countries (2009). In the United States in 2010, approximately 49 million citizens lived in food insecure households, coming to about one sixth of the total population of 304 million (FAO, 2009). Between 1990 and 2007, the number of hungry people globally declined rather sharply, but since 2008 progress in hunger reduction has leveled off (FAO, 2009). These statistics, along with the fact that 40% of what is produced ends up in a landfill, appear to create a paradox: if we are producing more food than we use, why is it that so many people go hungry?

The percentage of food we waste is even more concerning when paired with the fact that the world population continues to grow. The United Nations predicts that by 2050 the global population will reach approximately 9.3 billion, increasing from today's population of 7.2 billion (2014). This will require an increase in worldwide food production of at least 70%, not

including crops grown for purposes other than consumption, such as biofuel production (United Nations, 2014). When comparing the necessary increase in production to the quantity that is currently being wasted, it becomes clear that efforts in both food waste reduction and proper food production are necessary.

Food waste is not only a hunger issue, but an economic issue as well. When one pound of food is thrown away, so are the resources that went into producing that food. This includes investments in agricultural production, processing and packaging, transportation and distribution, food preparation, and cooking costs. By sending 40% of produced food to landfills each year, the United States is wasting about $165 billion per year in production costs (IWRC, 2015). All of these costs result in higher food prices for the consumer.

Landfilling food waste is both expensive and environmentally unfriendly. As food scraps rot in landfills they release methane gas into the atmosphere. According to the Iowa Waste Reduction Center (IWRC), one third of the methane in the earth's atmosphere originates in landfills (2015). This is significant as it relates to climate change concerns; methane traps about 20 to 25 times more heat than carbon dioxide (IWRC, 2015). Food waste represents inefficient use of scarce resources and detrimentally impacts the economy and the environment.

Food waste occurs in all types of food distribution, from restaurants and grocery chains to institutions, such as hospitals and schools. While some may assume such large producers would be responsible for the majority of food waste, it's actually individual consumers that contribute the majority, producing 60% of all food waste. Results from a national survey in April 2014 reveal that 63% of consumers think food waste is an issue, but only 34% of respondents say that food waste was a concern in their homes (Doering, 2014). This shows that

consumers realize that food waste is an issue, but they are failing to take responsibility for it. Jerome Peribere, the CEO of packaging company Sealed Air, commented on the results reported in *The Des Moines Register* article (2014) stating, "Americans need to comprehend that their household behaviors are likely contributing to the problem and that they have the power to stem the tide by changing their food usage and storage behaviors."

Problem Statement

This is what we know about food waste: forty percent of all food produced in America ends up in a landfill. Food left to rot in landfills produces methane gas that traps about 25% more heat than carbon dioxide, contributing significantly to climate change. Discarded food scraps are not only expensive to landfill, but represent the inefficient use of scarce resources and detrimentally affect the economy and the environment. Individual consumers are responsible for 60% of food waste, but do not recognize the significance of their contribution to the problem. With all that we know, what can we do to address the problem of food waste? Why do people throw away such a high volume of edible food? What is being done nationally to combat this problem? What can be done at the local level to reduce the amount of food waste added to Iowa landfills each year?

Current Issue

Food waste is an issue at both a national and local level. In the United States, per capita food waste has increased by 50% since 1974 (Hall et al., 2009). This is equivalent to approximately 1400 kcal per person, per day (or 273 lbs/person/year). The US National Institutes of Health estimated that the production of wasted food accounts for the use of more than 25% of the fresh water used in the United States in one year and requires the use of about

300 million barrels of oil (Hall et al., 2009). To put this in perspective, in 2010, one million barrels of oil, aka 1/300th of the requirement, could:

- Produce enough energy to power a house until the year 83286
- Power all US traffic for 3.9 hours
- Meet the yearly energy needs of 22,890 Americans
- Generate $989,481,786 of GDP in America
- Power total world energy consumption for 8 minutes (Lubin, 2010)

This demonstrates the burden food waste is placing on our nation. If there is any hope in having sustainable food production and resource consumption to keep pace with the exponential growth of our population, something must be done to decrease the amount of food that is going to waste.

Consumers do not throw away this amount of food without reason; the causes of food waste are extensive. About 20-25% of household food waste is related to packaging (Williams et al., 2012). The main aspects of packaging cited for disposal in this study were: packages that are too large, packages that are difficult to empty, and packages that are past the “best before” date. Packages that are too large could be avoided by purchasing smaller packages or avoiding bulk-stores when buying for less people. Difficulty in emptying packages could be addressed through changes in the manufacturing process. Throwing away food because it is past the “best before” date could be avoided by educating consumers about the meaning of these dates. Therefore, food waste due to packaging, one of the largest contributors to the issue, could be reduced through either addressing the manufacturing processes or educating the consumers.

While packaging causes a large portion of food waste, not all foods are manufactured and distributed in packages. For this reason, identifying which types of foods comprise the majority of waste is valuable. Meat, including beef, pork, poultry, and fish, provides 41%, vegetables make up 17%, and dairy comprises 14% of the food that is thrown out in the United States (Buzby & Hyman, 2012). Depending on the type of food product being discussed, this waste could potentially be related to packaging. On the other hand, many grocery stores have deli and produce sections where the food isn't packaged for consuming until specifically chosen by the consumer. The deli section in a typical grocery store has the meat behind a glass enclosure that is packaged in a resealable bag once ordered by a grocery store attendant. Produce is normally seen displayed in grocery stores in an unpackaged state; the quantity purchased is up to the customer. There are the few specific types of vegetables that are pre-packaged, such as carrots and salads, but in a typical grocery store the majority of vegetables are available to be chosen at will by the customer. Dairy products, such as milk, butter, and cheese, tend to be prepackaged in grocery stores, instead of being open and packaged by a grocery store attendant or the consumer themselves. Meat and vegetables can be provided without tricky packaging, meaning that we cannot blame the waste of these products on poor packaging. It is clear that there is wide variability in whether food is pre-packaged or not, therefore educating consumers on proper storage of both would provide benefit.

Current Policy

This issue is undeniably significant, yet there is minimal legislation, whether federal, state, or local, on the books specifically related to food waste. The majority of legislation or policy regarding waste regulates waste management practices, specifically regarding the

disposal of hazardous waste. State and local governments typically manage the regulation of waste management facilities and recycling policies. On the contrary, there are few notable federal contributions to guidelines or legislation specifically regarding food waste.

The most relevant federal law related to food recovery is the Bill Emerson Good Samaritan Act, passed into law in 1996 (IWRC, n.d.). This law protects those who donate food in good faith from any liability if the donated products cause harm to the recipients. A major concern related to food donation is the possibility of litigation or bad publicity if donations should lead to foodborne illness. The Good Samaritan Act protects donors from these situations. The law covers grocery stores, restaurants, caterers, farmers, government entities, non-profit feeding programs, corporations, and individuals (IWRC, n.d.). This is the most significant legislation that aids the food recovery movement because it makes organizations feel safe to donate rather than just throwing away useful food products. Outside of this act, most other waste management regulations are found at the state or local level.

The Environmental Protection Agency published a graphic called the Food Recovery Hierarchy (Figure 1) in an attempt to educate the nation on ways to reduce food waste on multiple levels (2014). The hierarchy provides guidelines and suggestions for how to minimize the amount of food waste diverted to landfills from the most preferred to the least preferred. The idea is to begin at the widest part of the hierarchy, source reduction, and work towards the bottom, using each available strategy whenever possible to reduce food waste that would otherwise end up in a landfill. Whether one is a food producer, supplier, or individual consumer, habits and practices can be adjusted resulting in the reduction of surplus food generated. This is a useful tool when attempting to reduce food waste.

Figure 1. The EPA Food Recovery Hierarchy. Adapted from *The Food Recovery Hierarchy* by U.S. Environmental Protection Agency.
Retrieved from: http://www.epa.gov/foodrecovery/

The top level in the hierarchy is 'Source Reduction', or reducing the amount of surplus food generated. Source Reduction may seem as though it should be limited to food producers, but even individual consumers can participate in source reduction by adjusting shopping habits. Through meal planning, budgeting, and only buying food that is needed, individual consumers can reduce the amount of surplus food they have in the house, decreasing the opportunities to throw out unused food. The second level is 'Feed Hungry People', which involves donating unused, edible food to soup kitchens, food pantries, and homeless shelters. Thanks to the Good Samaritan Act, anyone from an individual to a corporation can donate food in good faith without risking blame for any harm resulting from the donated food. On level three, people are encouraged to donate food scraps to 'Feed Animals', an acceptable practice as long as local regulations are met (IWRC website). Level four, 'Industrial Uses', reveals that certain food scraps and some food by-products such as oils can be used to produce energy or be modified

into fuels. The fifth level is 'Composting'; a process that turns food scraps into a nutrient-rich soil ideal for gardening. Composting is a practice that is very useful for gardeners, but is not always a realistic or practical option for apartment dwellers or those who have no use for the composted material. The bottom level on the hierarchy is 'Landfill/Incineration'. This is the last resort and represents the smallest portion of the hierarchy. Ideally, the use of the first five levels of the hierarchy greatly reduces the percentage of food waste entering our landfills (EPA, 2014). While programs that address any of the levels can be useful, it is easier to begin at the top with 'Source Reduction' and work towards the bottom, as the top levels in general require fewer resources and do not involve strictly regulated and technical processes, such as composting. Throughout this paper, references will be made to the Food Recovery Hierarchy (Figure 1) connecting each program or strategy for food waste reduction to a level on the inverted pyramid. This will allow us to evaluate the programs already in place along the EPA guidelines and determine where there are gaps that need to be filled.

Current Issue in Iowa

In 1998, 2005, and 2011, the Iowa Department of Natural Resources (DNR) sponsored a study evaluating samples of waste at a handful of landfills across the state. The study has provided us with insight to food waste levels in Iowa. The Iowa Statewide Waste Characterization Study, most recently conducted by the Mid Atlantic Solid Waste Consultants (MSW), provides statistics and compositions of the types of materials ending up in landfills in Iowa (Iowa DNR, 2011). Utilizing the information across all three studies, we are able to evaluate trends over time regarding the food waste ending up in landfills. This information is reflected in Figure 2 and 3 below.

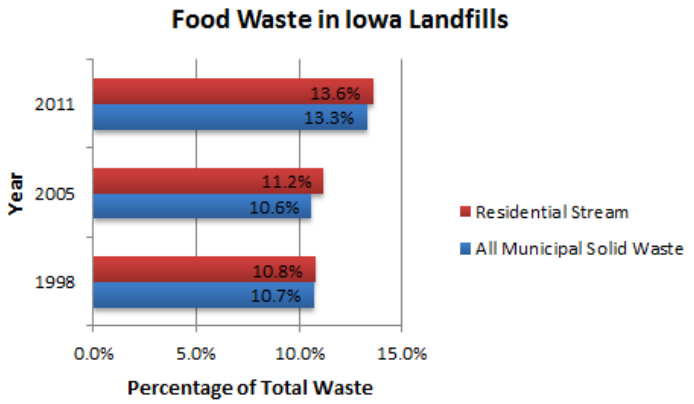

Figure 2. Food waste in Iowa Landfills. This graph shows the results of a sampling of food waste in specific streams in landfills across Iowa (Iowa DNR, 2011).

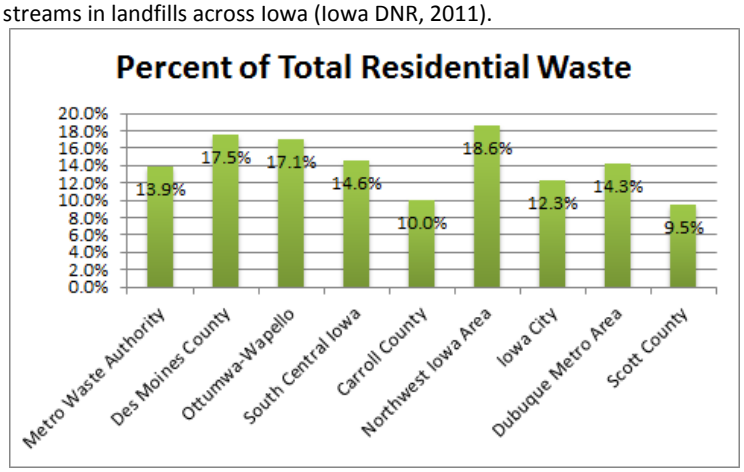

Figure 3. Percent of Total Residential Waste. This graph shows the percent of total residential waste that is made up of food waste in various communities in Iowa (Iowa DNR, 2011).

Based on the Figure 2, it is evident there has been an increase over the years in food waste, specifically in the residential waste stream. Food waste has shown up in the top 10 most

prevalent materials in the municipal solid waste stream (MSW) in addition to the residential stream, demonstrating the magnitude of the problem. In fact, food waste was the number one most prevalent material in landfills in both the MSW and residential stream across all years analyzed (see Appendix A, Tables A1 and A2). Although still high in the Industrial/Commercial/Institutional (ICI) and total Solid Waste stream, food waste was beaten out for top spot by OCC and kraft papers, and mixed construction and demolition material (Iowa DNR, 2011). Since food waste appears to be evident more so in the residential and MSW streams, focusing on decreasing the waste from either of these sources will have a larger impact on food waste in Iowa.

Figure 3 details further the amount of food waste in various landfills in Iowa, breaking down the data by specific county and community landfills. It shows that some communities, such as Scott and Carroll counties, may manage their food waste better than the Northwest Iowa, Des Moines County, and the Ottumwa-Wapello communities. Des Moines is categorized into the Metro Waste Authority section, which appears to be just around the state average of 13.3%, meaning that there is room for improvement.

Between 1998 and 2011 in Iowa, the percentage of food waste relative to all waste in landfills increased from 10.4% to 13.3% (Iowa DNR, 2011). Of the 43 municipal landfills in the state, only four of those facilities provide composting services for food scraps. Those composting services are usually limited to commercial use and are inaccessible to individual consumers. If more of this food were composted, there would be a smaller impact from Iowa on the content of methane in the environment.

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Other Cities

In order to develop a solution in the Des Moines community, we felt it was necessary to delve deeper into the actions that other cities in our country have taken to combat the issue of food waste. We wanted to look at cities that are larger than Des Moines, such as New York and San Francisco, as well as some that are somewhat closer to Des Moines demographically, to see if they had any techniques that could be replicated. More specifically, we looked at other cities in Iowa to gauge if any local programs near Des Moines have been implemented successfully. A few of the Iowa cities and organizations that have helped their residents understand food waste and help decrease its impact in their community are Dubuque, North Liberty, Iowa City and the Cedar Falls based Iowa Waste Reduction Center (IWRC). To gauge these cities' similarities to Des Moines, each section on cities outside of Iowa will begin with demographic information on the citizens, and then move into programs that have been successful in addressing food waste.

San Francisco

San Francisco has an estimated population of 852,469 as of 2013. There are approximately 345,244 households located in the city. The highest concentration of the population is 25 to 54 years of age, with the highest percentage being 25-34 years old (United States Census Bureau, *San Francisco*).

The city of San Francisco collaborated with Sunset Scavenger Company to create a program called Fantastic Three. This was designed to create a curbside collection for food scraps, food-soiled paper, and yard waste. The project started after a study in 1996 showed that 30 percent of the 20,000 tons of garbage thrown away every year was food waste,

(Cal.gov, 2002). This program was the first in the nation to initiate a large-scale curbside collection of food waste. The Fantastic Three is named for the three bins that each household uses. Trash goes in black bins, compost and organic materials go in green bins, and other recyclables (paper, glass, metal) go in blue bins. The city is able to issue fines for noncompliance, but to avoid this agencies spend a lot of energy providing community outreach programs to explain the importance of the program (Howard, B. 2013). Currently, about 90% of all households participate in the program, resulting in 150,000 tons of food waste being diverted from landfills annually (Yepsen, R. 2015). The Fantastic Three program covers the fifth level of the Food Recovery Hierarchy (Figure 1) by diverting waste from landfills to composting facilities.

In 2009, the city passed an ordinance that made composting food waste mandatory. This was done with the goal of making San Francisco a "zero waste" city, ultimately sending no waste to landfills. The city currently diverts about 80% of all waste to recycling and composting. The vision seems to be gaining momentum because just three years ago only 400 tons of food waste was collected per day, and now more than 600 tons of food waste is collected a day (Howard, B. 2013).

Portland

The city of Portland has grown to a population of 583,786. There were approximately 250,133 households in the 2010 census. The largest concentration of the population is between the ages of 25 to 35 (United States Census Bureau, *Portland*).

In June 2006, the Portland City Council developed a prevention and recycling plan. Portland's food waste reduction program is not mandated; if a household chooses not to

participate there are no fines. The purpose of this plan was to achieve the goals of a 75% increase in recycling by 2015, reducing greenhouse gases, achieving no growth in the waste stream, and in general becoming more sustainable (City of Portland Oregon, 2006). The pickup for this program is done via the curbside on the same day as trash pickup, where food and yard waste are combined into the same container. During the first year of the program, Portland saw a 37% decrease in trash production and collected 85,000 tons of organic waste (Earth911, 2013). Similar to the program in San Francisco, Portland's operation addresses the 'Composting' level of the Food Recovery Hierarchy (Figure 1).

The Portlandoregon.gov website contains informational videos that help consumers recycle the correct way. These videos include information on what food is appropriate to compost, the food scrap collection process, kitchen pail care, and outside curb container care, (City of Portland Oregon, 2006). Portland also developed an outreach and educational program to get residents and commercial facilities onboard. This included knocking on every 10 residential doors, as well as conducting recycling events with printouts and flyers to provide the public with more information on the program (City of Portland Oregon, 2008).

Seattle

The city of Seattle has grown to 640,500 in 2014. This is an increase from the population in 2010 of 608,660. There were approximately 283,510 households in the 2010 census. The largest concentration of the population is between the ages of 25 to 35 (Seattle Department of Planning and Development, 2015).

In 2014, Seattle already had a composting program in place that diverted 38,000 tons of food scraps from landfilling. Even with this program, the city was sending approximately

100,000 tons of food to a landfill in Eastern Oregon every year. The Seattle City Council took on this issue, and passed an ordinance on September 22, 2014 that prohibits the addition of food scraps to Seattle's residential and commercial garbage, with a goal of recycling or composting 60% of its waste in 2015. This began in October of 2014 with an educational campaign and continued with the prohibition of adding food scraps to garbage beginning in January 2015. The enforcement of associated fines will begin July 2015. If a commercial or multifamily facility is found to be out of compliance there will be a $50 fine assessed. For single-family homes, there will be a $1 fine added to their garbage bill. In order to be considered out of compliance, the city will have to prove that there was more than 10% recyclable or food waste volume in the garbage (Seattle Public Utilities, 2015. *Food Waste Requirement*). This program again address the fifth level of the Food Waste Hierarchy (Figure 1) by diverting food scraps from landfills to composting facilities.

Seattle created an educational program along with mandating recycling food waste with the ordinance passed last September. On the Seattle.gov website, there is a section on preventing food waste that includes what types of food waste can be composted and what types are not recommended. There is also a section on food date labeling. This section explains what food labeling is, along with a link to the USDA website on their fact sheet. The fact sheet explains how long foods are good for when stored in the fridge or freezer, and when to use a particular type of food. The next section explains proper food storage, including links to a produce storage guide and databases where consumers can search to find out how long and how best to store food. There is also a document on what food can be frozen for later use. The last section includes links to various websites that show recipes that can be applied to

leftovers to create completely different meals (Seattle Public Utilities, 2015. *Prevent Food Waste*).

Seattle.gov also has resources on composting. It gives links to information on how to compost at home along with the different types of compost containers. There is also printable material for various information and resources around composting (Seattle Public Utilities, 2015. *Food Waste*). By providing this educational information to residents, Seattle is successfully addressing the first level of the Food Recovery Hierarchy: Source Reduction (Figure 1). Teaching proper food storage, the meaning of date labels, and providing ideas for leftover uses are all strategies for reducing the amount of food waste generated to begin with.

New York City

The city of New York has an estimated population of 8,405,837 as of 2013. There were approximately 3,371,062 households counted in the 2010 census. The largest concentration of the population is between the ages of 25 to 54. The highest age percentage is the 25 to 34 age range (AreaConnect, 2015).

The state of New York passed legislation in 1988 to establish the state's Solid Waste Management Act. The goal was to reduce the amount of waste generated, reuse or recycle materials, recover energy from solid waste, and dispose of solid waste by approved methods (New York State Department of Environmental Conservation, 2015). Product Stewardship was also created to further reduce trash and costs by extending the, "role and responsibility of the manufacturer (also known as the producer or brand owner) of a product or package to cover the entire life cycle, including ultimate disposition of that product or package at the end of its useful life" (New York State Department of Environmental Conservation, 2015). By developing

extended roles and responsibilities, Product Stewardship creates direct cost savings and no-cost expanded service.

According to the New York Sanitation, up to 31% of the waste stream from New York City is organic waste. In order to combat this, the city has created a number of programs for residents to participate in. Specifically, New York City has started an organics collection program that hopes to expand into more neighborhoods within the year (New York Department of Sanitation, 2015). This is currently a pilot program that collects yard waste, food waste, and food-soiled waste. The waste will be collected curbside in separate containers from the regular garbage. This program, just like those in San Francisco, Portland, and Seattle, addresses the 'Composting' level of the Food Waste Hierarchy. Providing composting services in large cities such as these is ambitious, especially in New York City where such a high percentage of the waste stream is represented by food waste (New York Department of Sanitation, 2015).

Dubuque

Dubuque was the first city in Iowa to implement a food waste pickup program for their residents, called GreenCart. Although consumers need to subscribe to the program, they only pay a minor fee of $1.00 a month that gets added to their utility bill (City of Dubuque, 2015). This program has helped the community:

- Extend the landfill's life;
- Reduce pollution (especially methane);
- Maintain Dubuque county's recycling rate above 25 percent;
- Create a beneficial compost product for gardens, landscaping, erosion control, and watershed protection (City of Dubuque, 2015).

Dubuque also distributes educational material to their residents, such as those shown in Appendix B, to help them understand the benefits of food waste reduction. The combination of GreenCart and educational materials has allowed the city to divert nearly 100 tons of customer food scraps annually from landfills to composting facilities, another example of satisfying the fifth level of the Food Recovery Hierarchy (Figure 1; City of Dubuque, 2015. Document Center).

North Liberty

North Liberty, a suburb of Iowa City, began their food waste composting program for residents as a pilot program in September 2014, attempting to fulfill the fifth level of the Food Recovery Hierarchy guidelines. According to an article written about the program, it came about after a 2011 waste characterization study showed that, "about 25 percent of what goes into the landfill each year is considered organic waste. Another 27.5 percent is recyclable cardboard and paper. All told, that's 28,000 tons each year going into the landfill that could be reused or recycled," (Schmidt, 2014). The program has since been extended to all residents, who are required to purchase a yard waste bag for $1.65 to line their compost bin for every pick up. The types of food waste able to be picked up include not only the traditional fruits and vegetables, but also meat, seafood, grains, and dairy (City of North Liberty, Iowa). Although the infrastructure is in place for a great food waste reduction program in North Liberty, it hasn't quite caught on as quickly as Johnson County Refuse, the waste pickup organization in North Liberty, would have hoped. According to an article written for Waste360, "the company currently collects food waste from slightly more than 60 residents out of 6,000 houses in the community," (Kadleck, 2015). Despite the low numbers, North Liberty has inspired other cities to begin their own food waste programs, one being Iowa City.

Iowa City

Iowa City currently offers commercial food waste composting, but they are hoping to implement curbside food waste pickup for their residents in 2015. Utilizing the US EPA's 'Food: Too Good to Waste' program, Iowa City has been educating their consumers on waste reduction strategies. This began as a pilot program last fall in 2014, based on the toolkit developed by the EPA, and led by Ashley Zanolli, an employee of the agency. The purpose of the program is, "to reduce wasteful household food consumption by focusing on social marketing incentives and messages directed at individuals within targeted communities to consume less by wasting less food," (Zanolli, 2012). This program is utilizing a small pilot group, allowing them to test the program with a limited group of people. Their aim in doing this is to evaluate the ability to change individual behavior and get a generalizable measurement of the results. When designing a pilot program such as the one Iowa City is testing, the EPA recommends addressing some key areas:

- Objective and goals in relevance to the community,
- Target population and sample size,
- Targeted strategies, tools and budget,
- Time frame and pilot implementation length,
- Outreach and community partners,
- Data collection and analysis (Toolkit Implementation Guide, 2013).

Iowa City also conducts regular educational workshops, providing consumers with statistics on food waste and materials to help them reduce their impact, including shopping and

food storage strategies, as shown in Appendix C. Using this program, Iowa City is targeting the first level of the Food Recovery Hierarchy by educating residents on food waste reduction.

Cedar Falls IWRC

It is clear that Iowa is working towards greatly reducing food waste in landfills across the state, providing options for residents, businesses, and organizations depending on the city. Many other cities in Iowa, other than those previously mentioned, have been doing their part to reduce food waste. For example, Cedar Rapids offers commercial and garden food scrap pick up. In addition, there are many organizations whose mission is to educate and reduce food waste in cities across Iowa. One of those organizations is the Iowa Waste Reduction Center (IWRC) based in Cedar Falls, Iowa. As a division of the College of Business Administration at the University of Northern Iowa for the last 26 years, "the IWRC has been working with businesses to protect Iowa's environment through technical assistance, waste reduction, and pollution prevention," (IWRC-About, 2015).

The IWRC works in conjunction with organizations across the state to educate the residents of Iowa on food waste and promote strategies to reduce food waste in their community, such as composting. The Rural Utilities Service Grant through the U.S. Department of Agriculture currently provides funding for this organization, which was developed due to the increase in food waste in landfills across Iowa (IWRC, 2015. Food Waste in Iowa). They offer workshops that have been utilized in cities including Dubuque, Council Bluffs, Cedar Falls, and even Des Moines. Through their many programs the IWRC has targeted multiple levels of the Food Recovery Hierarchy (Figure 1) and uses that graphic as a guideline. The IWRC has developed relationships with many cities, businesses, and other organizations, helping to

implement food waste reduction programs throughout the state. Therefore, we believe a partnership with the IWRC would be essential in creating an effective educational program in the Des Moines area, which could ultimately lead to the implementation of a residential food waste program.

Des Moines

Now that we've heard about what other big and small cities are doing to combat food waste, we will delve into what the issue is like in Des Moines specifically. To start, as of 2013 the Des Moines population was estimated to be ~207,000 (United States Census Bureau, 2013. Des Moines), with the entire metro area coming in at ~570,000 (City of Des Moines, 2015). The female gender is responsible for 51.2% of the population, while the male gender is responsible for the other 48.8%. The highest age percentage is between 25-34 years old, with the highest concentration from 25-54 years old (United States Census Bureau, 2013. Des Moines). This information will help to determine whether or not the programs in other cities will be realistic in Des Moines.

Des Moines Food Waste Characteristics

The Iowa Statewide Waste Characterization Study provides statistics on the makeup of waste in landfills all across Iowa; including the Des Moines Area. These studies have allowed us to see that there has been an increase in food waste in the Des Moines area. The 2005 study revealed food waste in the residential stream being 9.8% of the total, while in 2011 it jumped up to 13.9% of the total residential waste (Figure 2). Although still the top material in the residential waste stream in the MWA facilities at 13.9%, it remains above average for the statewide amount of 13.3%, and therefore requires addressing (Iowa DNR, 2011).

Des Moines Food Waste Survey

We gathered further information on consumer knowledge in Des Moines on the topic of food waste through a survey conducted on 200 residents of the Des Moines metro area. Questions for inclusion in the survey were developed by each member of our team and deliberated on during group meetings. Once we had a list of questions we were comfortable with, we requested a pharmacy professor, Dr. Charles Phillips, and a law professor, Ellen Yee, to review the survey and give feedback. After we received their comments, we edited the survey according to their input and published via Drake Qualtrics Survey Software. Once published, we distributed the online link by means of social media, word of mouth, and e-mail. The questions utilized may be found in Appendix D. We left the survey open from March 5, 2015 to April 15, 2015. While 200 participants began the survey, 21 of them dropped out at some point throughout the survey.

The ages of the respondents ranged from 19-65, with an average of 30.5 years of age. Women made up the majority of responses (68%). When asked of their type of residence, 55% of respondents lived in a single-family home, 31% in an apartment, and 8% in a town home. Including children and roommates, the participants' current residence was made up of either just themselves (14%), two people (42%), three people (15%), four people (20%), or greater than or equal to five people (9%). The place of residence of these participants ranged from the majority in Des Moines (53%), followed by West Des Moines (16%), with the remainder scattered throughout the various suburbs, such as Altoona, Ankeny, Johnston, Urbandale, and Waukee. There were a total of 5 responses that were taken from respondents located in areas other than the Des Moines metro area, such as Iowa City and Ames. All of our participants

either have a full time (67%) or part time job (19%), or occupy their time as full time (31%) or part time students (15%).

Of the respondents, 88% believed there is an issue surrounding food waste, but according to Figure 3, only 18.7% of the participants knew the impact of food waste on landfills in Iowa. The top three food groups thrown away, ignoring the category of leftovers, were the same as the nation (Buzby & Hyman, 2012), however it seems that they throw away more produce (60%), than dairy (27%), or meat (11%) (Figure 4). Focusing on foods they seem to throw away most would be more beneficial to this constituency and have a greater impact on food waste. When shopping, 46% of respondents felt as though they buy more than they need, and only 36% claimed to budget the amount of money they spend on groceries. The main reasons cited for throwing away food were because something had gone rotten, or the "Use By" date had passed (Figure 5). When asked if they had ever participated in a food waste educational program, 94% said they had not, but 29% indicated that they would. After this question, they were asked what areas of food waste they would like to receive further information on, the results of which are shown in Figure 6. These results reveal that some citizens in this community want to learn more about food waste, especially if it could focus on the proper food storage techniques and the meaning of "Use By" dates.

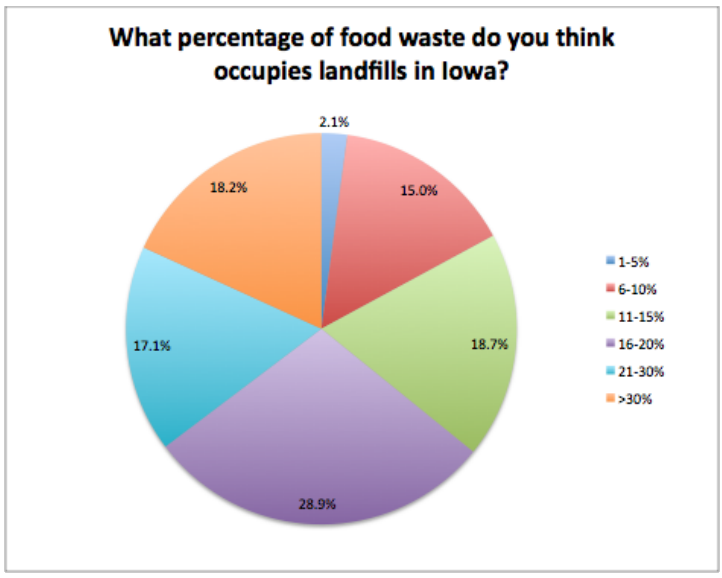

Figure 3. What percentage of food waste do you think occupies landfills in Iowa? This graph shows responses to the second question of the survey, showing a fairly even number of responses to each category. The correct answer to the question is 13.3%, which only 18.7% of the 188 respondents selected.

Commented [9]: I may be reading this chart wrong, but the way I read this indicates that the majority of people believe that food waste takes up a significant portion of our landfills, and more than half the respondents believe food waste represents a higher percentage of landfills than it actually does. I know that information is incorrect and that does demonstrate that people are uneducated in this area, but I think including this chart almost weakens the argument. Like someone could look at this and think, "Okay, so they don't know the correct statistic, but they know its a problem so what's the big deal? People are aware of this." Based on that I think we either need to remove this graphic or further explain that even though people know this is a problem, they don't do anything about it. Just my opinion so I haven't changed anything, but I think we need to talk about this.

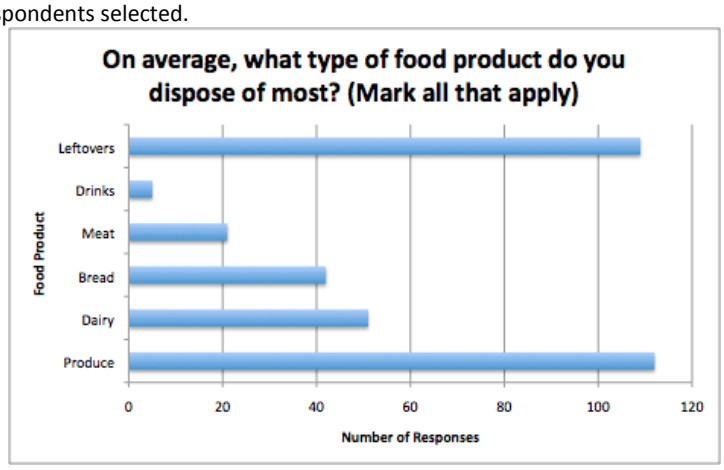

Figure 4. On average, what type of food product do you dispose of most? (Mark all that apply). This graph shows the answers to the fourth question of the survey, detailing the results from 187 responses.

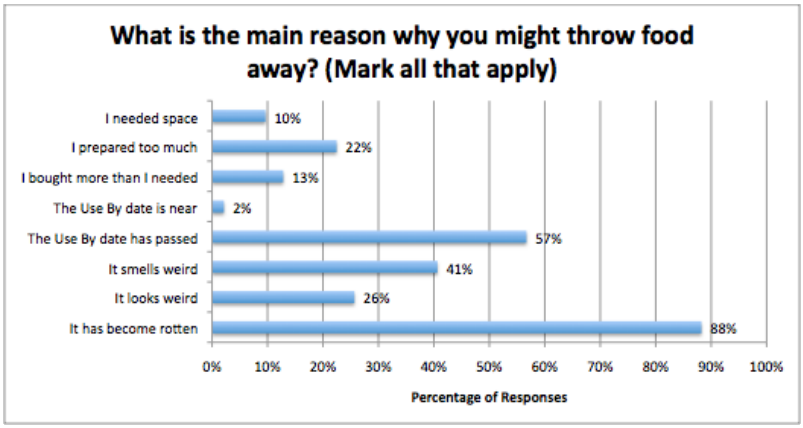

Figure 5. What is the main reason why you might throw food away? (Mark all that apply). This graph shows the answers to the eighth question of the survey, detailing the results from 187 responses.

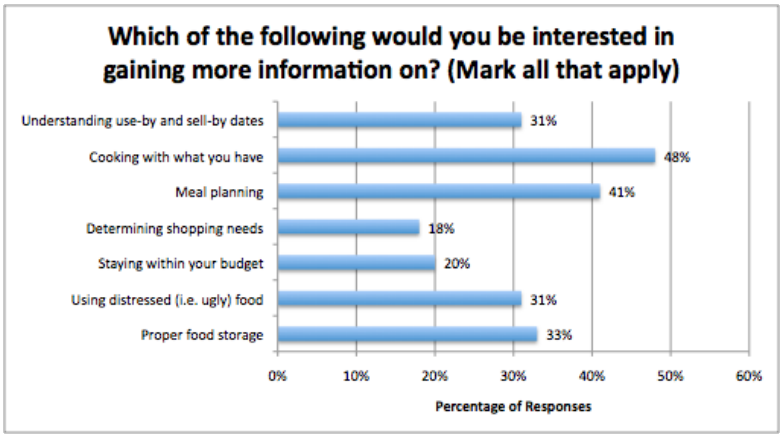

Figure 6. Which of the following would you be interested in gaining more information on? (Mark all that apply). This graph shows the answers to the fourteenth question of the survey, detailing the results from 172 responses.

This survey has many limitations. The largest number of responses we received on any question was on the first and it was 194, which only declined from there to a minimum of 172 responses. There number of female participants was also disproportionate to what is reflected

in the population. A larger sample size would help us to make better generalizations about the Des Moines community. Furthermore, only 53% of participants lived within the city of Des Moines, and this once again limits the generalizability of our study to Des Moines specifically as a city. However this could provide some insight into the metro area as a whole, so it could be taken as a positive outcome.

In conclusion, there is a general acceptance that food waste is an issue, but the specifics regarding the topic are not well known. The most commonly disposed of food products are similar to the national levels, and could help guide us in developing educational materials regarding the proper use and storage of those types of food. There is some demand for education, and these results highlight what areas they would be interested in learning about. While the results of this survey can help us in developing educational material, it is limited in its generalizability. Overall, this gives us vital information to help in our attempt to solve the issue of food waste in Des Moines.

Organizations in Des Moines

Many U.S. cities are working to reduce food waste through the implementation of food waste reduction programs, and Des Moines is no exception. There are many organizations currently working to combat food waste throughout the metro community. Some of these organizations include the Metro Waste Authority, Green RU, RecycleME Iowa, Eat Greater Des Moines, and NextCourse. These groups are utilizing many tactics to combat food waste including compost pick up, food donation, and providing links to educational information on strategies for food waste reduction, although not easily accessible to an average resident.

Metro Waste Authority (MWA).

MWA has been around since 1969, and manages and operates the landfill services in the Polk county area. In addition, MWA provides recycling and reduction programs within this region to educate the public on approved methods to decrease the amount of materials that end up in the landfill. The Des Moines metro MWA facility has a garden waste pick up program, but unfortunately food scraps are not currently allowed within that garden waste. Although there is no current food scraps pick up program, the Metro Compost Center in Des Moines and the Metro Park East Landfill located in Mitchellville, IA, about 18 miles east of Des Moines, do accept pre-approved, commercially generated food waste at their composting facilities. Metro Park East Landfill also has the ability to convert said food waste to energy by capturing the methane gas that is released (Metro Waste Authority, 2015). The MWA facilities are two of only four municipal landfills in the state that offer compositing services, as previously stated. This provides great benefits to the Des Moines area, and reduces food waste that would previously have ended up in landfills.

These two MWA locations are Iowa-DNR permitted composting facilities that have the ability to accept a limited amount of commercial and institutional food waste. Therefore, this service is limited to food waste generated by restaurants, hospitals, and schools. These facilities are only able to accept up to two tons of food waste per week, which cannot include meat, dairy, or any non-food compostable waste. It is required that these businesses contact the facilities in advance, and each entity is evaluated on a case-by-case basis to determine whether their material can be accepted (Metro Waste Authority, 2015). Although this is a great asset to the Des Moines community, and does help reduce the amount of food waste in the

commercial industry, there are currently no food waste composting facilities or pick up programs for individual consumers within Des Moines.

Although not currently offering any food scraps pick up program to curb residential food waste, MWA has been an active participant in 2 of the 3 years of the DNR sponsored Waste Characterization Study previously mentioned (Iowa DNR, 2011). This has allowed the DNR to evaluate the food waste problem, in addition to other waste in the Des Moines area. MWA also provides educational materials on their website to aid their customers on food waste reduction strategies and other options available in the Des Moines area to decrease the waste ending up in landfills from the residential area. Some materials they have available include a toolkit developed by the U.S. EPA, which helps calculate and track food waste, as well as information on donating unused prepared food to rescue organizations and meal sites to keep it from going to waste. Their website also includes resources on how consumers can begin composting at their houses to decrease food waste coming from their homes (Metro Waste Authority, 2015).

GreenRU.

Headquartered in Des Moines, GreenRU is a 'zero-waste' recycling organization that creates programs for local restaurants, businesses, schools, universities and other organizations to keep food scraps and organics out of landfills. Their program includes employee training and education materials to educate their clients on the benefits of food waste diversion, such as composting scraps and donating edible food to homeless shelters. GreenRU utilizes the food scraps within their composting facility to create, "rich compost for use on farmland, landscaping, sports turf, and other land applications," (Green RU, 2015).

Businesses and organizations that would like to participate in this program are able to reach out to GreenRU, who will provide them with carts and bins to store their food scraps. An assessment can be completed by GreenRU to determine the amount of food waste currently within the organization, and how many bins they may need. GreenRU will then pick up the bins on a predetermined schedule, and return the food scraps to their facility to be composted. They also provide their clients with educational materials on how the organization's waste will be reduced through greater participation, and other benefits that decreasing food waste will provide. This program is available to these organizations at a cost, and is unfortunately not currently offered to individual consumers (Green RU, 2015). As such, this program, which addresses several levels of the Food Recovery Hierarchy, leaves gaps by not providing for individual consumers, and therefore does not help to alleviate consumer produced food waste.

RecycleMe Iowa.

Another organization working to reduce waste in the Des Moines area is RecycleMe Iowa. Although not specifically geared toward food waste, their organization offers a recycling pick up program for residents living in apartments, condos, or townhomes where recycling options may not be convenient or available. This only includes traditional recyclable items, such as paper, cardboard, and glass, but what makes RecycleMe Iowa relevant to food waste is their educational programs as well as continuous support of food waste programs completed by other organizations (RecycleMe Iowa). Their overall goal is to create a greener, more sustainable Des Moines, and therefore they provide valuable information on composting and food waste workshops via their website and Facebook page. This is an attempt to address the first and fifth levels of the Food Recovery Hierarchy by educating on source reduction and

composting, but unless individual consumers are clients of RecycleMe Iowa, they are not likely to come across this information. Even so, this helps to reach out to more individuals on the importance of food waste, and provides support to other organizations with similar goals.

Eat Greater Des Moines.

One of the major organizations within the Des Moines area working toward creating a positive impact on the food lifecycle, including food waste, is Eat Greater Des Moines. Their mission statement, "*To identify, develop and connect resources with the broader community to support the entire food lifecycle in central Iowa,"* demonstrates their commitment to improving Des Moines and helping the city reach sustainability. The organization has five major areas they focus on including Policy, Health and Nutrition, Access, and Hunger (Eat Greater Des Moines, 2015. About Us). The aim of Eat Greater Des Moines' food waste reduction program is to combat hunger. The organization does this by collecting donated food from restaurants and other food service providers and distributing the food to people in need (Eat Greater Des Moines, 2015. Food Rescue). This requires partnership with many organizations and businesses in the Des Moines area, all of whom are creating a positive impact by diverting food waste from landfills to the hungry in the Des Moines area.

Due to the difficulty of accurately predicting how much prepared food a company or organization may need for a dinner or event, there is often perfectly good prepared food that is getting thrown out. This is where Eat Greater Des Moines is making a difference. They provide volunteers to collect the food and distribute it to those who need it and can use it before it goes to waste. In doing so they are fulfilling the second level of the Food Recovery Hierarchy by 'Feeding Hungry People' with the donated food.

> "In the greater Des Moines area, Central Iowa Shelter & Services' Food Rescue Crew works with restaurants, hotels, caterers, event planners, and others to identify excess prepared foods suitable for donation. Volunteers are dispatched to pick up donations of prepared food and bring them to meal sites across the metro area. (Fresh and shelf-stable items can be donated to the DMARC Food Pantry Network)." -Eat Greater Des Moines (Eat Greater Des Moines– Food Rescue, 2015).

Eat Greater Des Moines is an advocate for local, sustainable, and nutritional food; which not only supports our community and improves health, but also contributes to food waste reduction. With more people being aware and purchasing food from farmer's markets and CSA's, there is more food that can be composted. This is due to the fact that the majority of these foods are fruits, vegetables, and grains, which work great in composts. Eat Greater Des Moines also provides expansive educational information on gardening, composting, and food donation on their website and Facebook page, reaching a large portion of the community due to the vast amount of projects with which the organization is involved. Even so, this educational information, which hits the first level of the Food Recovery Hierarchy, may not make it to the average residents of Des Moines, especially if they do not participate in any of the programs with which Eat Greater Des Moines works.

Next Course.

One organization that works in cooperation with Eat Greater Des Moines is a Drake University Student Group known as Next Course. Next Course is an official chapter of the Food Recovery Network that fights food waste and hunger by recovering perishable food that would otherwise go to waste and donating it to people in need (Next Course, 2015). Next Course has

been working with Sodexo, the food service provider for Drake University's dining facilities, and according to Laura Leben, the Next Course Food Recovery Coordinator, Next Course has already rescued over 3400 lbs. of food since August 2014, (Leben, L., personal communication, 2015). This food has been rescued from Drake's Hubbell Dining, catering events on campus, tailgating, Drake Relays, and other special campus events. They have donated to multiple nonprofit organizations in Des Moines including Hope Ministries Bethel Mission and Central Iowa Shelter Services, and based off of the conversion rate of 1 pound to 1.2 meals, they have provided over 2,833 meals to those in need. The services provided by Next Course fulfill the second level of the Food Recovery Hierarchy by 'Feeding Hungry People' with unused but edible leftover food.

It is clear there are many great organizations and programs in Des Moines that are working to reduce food waste, yet there is a lack of services available to consumers to recycle their household food scraps. In addition, we believe more can be done in terms of education to provide information to residents on the impacts of food waste and what they can do to mitigate it. Despite the efforts by these organizations, with their focus primarily on businesses and food service providers, they don't reach the general population as much as we would like. Though most of these organizations provide links to educational materials and even operate educational seminars, that information is not easily accessible to the average resident of the Des Moines metro area. Residents either have to already be aware of the programming or have to consciously seek out the information in order to find it. While we know from our survey results that people believe food waste to be a problem, we also know that they are not inclined to seek out education on the matter; the information needs to be handed to them. This represents a gap in the first level of the Food Recovery Hierarchy: there is not enough

information on Source Reduction made easily accessible to individual consumers. We believe that by reaching out to individual households with food waste education and working to mirror efforts by other cities we have already highlighted, we could make an even more substantial difference in the amount of food waste produced in the Des Moines area.

The Solution

Based on our research, it has become clear that creating partnerships in the community and helping consumers learn easy ways to reduce waste is essential when looking to make a substantial impact to the food waste problem in the Des Moines area. Because of this, we felt that working with NextCourse and helping them connect to other organizations throughout the Des Moines area would assist them in their goal to provide food to those who need it. This would not only help reduce the number of people who go hungry in Des Moines, but would also help us in our goal of reducing the amount of food waste in landfills. Additionally, collaborating with other organizations and educating the consumers of Des Moines on proper food storage and knowledge will help to decrease the impact that Iowans have on the nationwide issue of food waste.

The Proposal

Drake University's Next Course already provides food recovery pick-up services for events on Drake's campus. Through discussions with Next Course, we discovered that the organization would like to expand their food recovery efforts into the Drake neighborhood by offering their services to local food suppliers. To help Next Course pursue this goal, we have developed a generic proposal designed to submit to local food producing businesses in the

area, included in Appendix E. The purpose of the proposal is to introduce Next Course, its mission, and offered services to potential partners.

The proposal accomplishes three specific tasks: it explains the problem of food waste, it introduces Next Course and its mission, and it explains the benefits of the potential partnership. To explain the problem, the proposal provides statistics to demonstrate the food waste issue, highlighting the issue of hunger both nationally and within the state of Iowa. Once the problem is established, the proposal introduces Next Course and describes how it operates as a chapter of the Food Recovery Network. The impact that Next Course has on the community is explained by sharing the pounds of food rescued and used to feed hungry people around Des Moines. Finally, the benefits to the potential partner organization are outlined. These partners would benefit from a relationship that would provide volunteers to pick up the prepared, unused food they will not need, and bring it to designated sites to feed those in need. The Bill Emerson Good Samaritan Act is outlined, which explains how the law would protect the partner from liability should harm come to any recipient of the donated food. In addition, Next Course would provide educational materials for the store to distribute or make available to their customers. These educational materials, the second portion to our two-part solution plan, are designed to improve consumer understanding of the issues of food waste, why it matters, and what changes they can make in their shopping and storage habits to help reduce their impact. Our survey results have shown that customers have an interest in this information. Helping partner organizations to provide such educational materials would assist that organization in building stronger and more positive relationships with their customers, while simultaneously educating a larger portion of the Des Moines community. The proposal (seen in Appendix E) is

generic in nature, but provides a template from which Next Course can develop future proposals, as needed, that will be tailored to potential partner organizations.

Educational Program/Material

Collaborating with Next Course will move us toward reducing food waste in the Des Moines area, but it is clear that an educational program would fill the current void in food waste reduction. Our initial goal with the education program is to reach as many people as possible to help them understand the problem and provide them with some easy changes they can make to lessen their waste. We believe that through developing relationships with grocery stores and other food service providers, we will have a great outlet to distribute our materials in an environment where the problem begins for consumers. We hope to reach out to residents in other ways as well, such as through farmer's markets, Community Sustainable Agriculture (CSA) programs, and food co-ops. Individuals are purchasing foods that spoil more easily and could potentially be composted, preventing even more food from ending up in landfills. Some of the educational materials would include proper food storage strategies, understanding use-by and sell-by dates, and helpful shopping strategies. We believe this information would be beneficial to all residents, regardless of their interest in participating in a food waste pickup or composting program.

In addition to working with food service providers, it is important that we collaborate with other organizations already working to reduce food waste in Des Moines. The organizations we believe would help in our mission to reach out to consumers in order to reduce food waste are Eat Greater Des Moines and the Iowa Waste Reduction Center. Eat Greater Des Moines has already been working to build up a food donation program, which

Commented [10]: A thought: There is a lot of information in this section compared to the section on the proposal, as we have discussed. I think a lot of what is in this section has value, but a lot of it can also fit in to the above sections which talk about the specific organizations. If we move those parts up, then this section can be purely about what we came up with and why. We can refer back to the existing programs or just say something like, "we built off of example of the seminar hosted by the IWRC, as previously explained." Thoughts on that? I think would help to really clarify what our solution is and our reasoning.

Commented [11]: I am willing to make the changes, btw, I just did not want to do so without discussing first.

Commented [12]: I don't disagree that some of the information can be moved up. However, our solution/education is very limited without including the workshops, challenges, etc. So, I can move the introduction to these ideas to the above area, and just mention in education that we will be build on their ideas, if you think that will help.

Commented [13]: Also, I agree that more should be added to the proposal section. When I was asked to write this section, I was initially told it would just be an introduction to the proposal :)

connects donors with recipients to ensure food gets into the hands of those who need it. This has contributed greatly to reducing the food waste problem in the Des Moines area, and has made a huge impact on the hunger issue.

Although based in the Cedar Falls area, the Iowa Waste Reduction Center (IWRC) has been working with organizations in cities across the state to reduce the food waste problem in Iowa. "Through 2013, the IWRC implemented the Iowa Food Waste Reduction Project, hosting workshops and providing resources throughout Iowa in an effort to reduce the amount of food that is wasted, and disposed of in landfills," (IWRC, 2015. About). We feel that with their expertise in the area, teaming up to present workshops on food waste in the Des Moines area would be necessary to reach out to residents who want to learn more about the problem and how they can be a part of the solution. A workshop had previously been done in the Des Moines area, but the focus seemed to be more on the commercial side. We propose building off of the agenda of the workshop previously hosted in Des Moines (seen in Appendix F) to develop a new workshop focusing on consumer food waste. We believe that it would be beneficial to maintain the sections on the specific problem and challenges, but would like to see the addition of resources and strategies for individual consumers to reduce their impact. This would include not only provide tips on reducing the amount of food they waste, but also resources on residential composting. We feel that by hosting these workshops in educational institutions, and distributing materials at events such as the Downtown Farmer's Market, we could reach a multitude of consumers who would be interested in learning more about the issue. Implementing these workshops is a long-term goal, and something that should be considered as this program moves forward and a relationship is developed with IWRC.

Commented [14]: There were a few sentences that followed this that i deleted quick while printing for the writing workshop. if you guys have those stats feel free to fill them in, otherwise i think that we could just cut it and be fine as well. Currently the organization partners with ___ food service organizations, donating to ___non-profit organizations in need. This has cut down on the food waste problem in these food service organizations by ___%. With an already strong presence in the community, and a similar goal to our own, we believe this partnership would be essential to continuing efforts toward combating the food waste problem.

Another concept we thought would be beneficial to the Des Moines area food waste issue is the implementation of a program mirrored off of the EPA's 'Food: Too Good to Waste' program. We would also consider this to be a long-term goal that could be modeled off of the program implemented in Iowa City. This would lead us in the direction of creating a food waste pick-up program in the Des Moines area, dependent on residents' willingness to participate. In addition to this program, the EPA has developed a challenge we feel would encourage individuals to evaluate their food waste habits, which is shown in Appendix C. The challenge asks them to: measure the volume of their current food waste, implement some of our recommended reduction strategies, and then compare their end food waste to see how much food and money they've saved over that time period. This will help individuals understand the benefits of reducing food waste in their own homes, as opposed to just the overall benefit to the environment. The goal of the challenge is to get individuals to realize the amount they contribute to food waste, adopt our recommended strategies for food reduction, and understand the need for a residential food waste pickup program in Des Moines (Food: Too Good to Waste).

Based on the results from the survey we conducted (Figures 3-6), we decided to focus the educational materials according to what the consumers want to know. The respondents reported they would prefer to have information regarding proper food storage and understanding Use-By and Sell-By dates (Figure 6). For this reason, we have developed an educational brochure containing information on the meaning of Use-By and Sell-By dates (see Appendix G). Most consumers are not aware that there is a difference between these dates. There is no universal system in place to create consistency between product dates. This means

that dates are regulated by individual manufacturers. The only food that is required to have an expiration date is infant formula and baby food. According to the United States Department of Agriculture, "sell by" refers to how long stores should show the product for sell. This is not a date when it needs to be consumed. "Best if used by" are suggestions for best quality. It does not take into consideration purchase or safety of product. "Use by" is the last date recommended for use of the product for peak quality.

When asked which foods they throw out most frequently, in order from most frequent to least, the respondents to our survey claim to throw out leftovers, produce (i.e. vegetables and fruits), dairy, bread, and meat (Figure 4). Therefore, the educational pamphlet explains proper food storage tips and tricks and proper length of storage all of these products with the exception of leftovers. In general, leftovers should be evaluated on a case-by-case basis, and should be used as soon as possible. Below we will detail some tips and tricks for the various food products according to the article *Food Storage for Safety and Quality* by P. Kendall and N. Diamond (2012). Bananas should be unpeeled if stored in the fridge, and peeled, dipped in lemon juice, and stored in a freezer bag when stored in the freezer. Freezing milk can alter its taste and palatability, so milk stored in a freezer is best reserved for cooking. However other dairy products, such as sour cream, whipped cream, yogurt or eggs (although not technically dairy), are not recommended to be stored in the freezer. Bread can be stored in the fridge to avoid mold growth, and flour can last up to 8 months in an airtight container in the fridge and 12 in the freezer. Meat, if kept in the freezer, should be removed from the original packaging and placed in a freezer bag. The article also breaks down how many days and months food can be properly stored in the fridge or freezer. In the educational pamphlet, we consolidated this

information into their proper food categories in charts to detail how long more popular items could be stored for. We also provided a few additional resources consumers could go to for further information. This includes where to properly store food in a fridge and what can and cannot be stored in a fridge.

Through collaboration with Next Course, Eat Greater Des Moines, and IWRC, we feel that this educational pamphlet can easily be distributed to and understood by the general population. The hope for this pamphlet is to make an impact on individual consumers by providing them with some waste reduction tips and strategies. This amends an existing lack of education on source reduction and addresses the first level of the Food Recovery Hierarchy (see Figure 1). These materials combined with the many programs already in the works both locally and nationally will help to further the cause of food waste reduction in Iowa.

Conclusion

Through literature reviews and surveys, this project has confirmed that food waste is a significant environmental and economic problem in the Des Moines area, as it is across the nation. We know that individual consumers carry the majority of the responsibility for food waste, but on average do not make food waste reduction or food recovery a priority in their homes. Using the Food Recovery Hierarchy as a guide, we have analyzed existing programs around the country and within the state of Iowa. In doing so we discovered that most programs address the second level of the Food Recovery Hierarchy, 'Feeding Hungry People,' by redirecting unused and edible food to soup kitchens and food pantries, demonstrated by Drake University's Next Course organization. Several cities outside of the state have found success fulfilling the fifth level of the Food Recovery Hierarchy, 'Composting,' by implementing food

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scraps pickup programs or by providing new composters with tips and instructions online. Even with this solid foundation of work already in place, there seems to be a lack of easily accessible and straightforward information to help individuals reduce the amount of surplus food they create. 'Source Reduction' is the first level of the Food Recovery Hierarchy and the easiest, most preferable way to decrease the amount of food waste diverted to landfills, yet there seems to be a void when it comes down to individual consumers.

Because of this gap in coverage, we have designed educational materials that address some of the most significant reasons that people throw food away, such as misunderstanding Use By/Sell By dates or storing food improperly. According to our research, this is information that people want, but do not seem to take the time to pursue. These materials can be distributed through partnerships with the preexisting organizations in the city that will not only provide people with the helpful information they want, but help raise awareness of the issue and the organizations working to solve the problem. Finally, the proposal created to help Next Course develop relationships with food producers and suppliers in Des Moines will help to build a sense of community with regards to the issue of food waste. This is not a problem that one determined group of individuals could solve. It is instead a problem that must be addressed by the entire community. By educating the general public and helping to build the existing food recovery network in Des Moines, reducing the amount of food sent to Iowa's landfills becomes an attainable goal.

Acknowledgements

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Ellen Yee, J.D., Professor of Law, Drake University Law School, Next Course

Laura Leben, Drake University, Next Course

Dr. Charles Phillips, Drake University College of Pharmacy and Health Science

Commented [16]: I added Professor Yee's Juris doctorate here, but I'm not sure if I did this correctly. Do you guys think this looks okay? I just thought we should put her full title.

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Appendix A

Iowa Waste Characterization Data

Table A1. Comparison of Top 10 Most Prevalent Materials in MSW Stream, (Iowa DNR, 2011). Retrieved from: http://www.iowadnr.gov/Portals/idnr/uploads/waste/wastecharacterization2011.pdf

2011	2005	1998
Food Waste - 13.3%	Food Waste - 10.6%	Food Waste - 10.7%
OCC and Kraft Paper - 9.0%	OCC and Kraft Paper - 8.5%	Non-Recyclable Paper - 10.3%
Other Film Plastic [2] - 6.6%	Mixed Recyclable Paper - 7.0%	OCC and Kraft Paper - 8.5%
Compostable Paper - 6.1%	Film/Wrap/Bags [2] - 6.6%	Film/Wrap/Bags - 7.5%
Wood – Untreated - 5.4%	Compostable Paper - 6.5%	Mixed Recyclable Paper - 5.4%
Demolition/Renovation/ Construction [1] - 5.4%	Other Plastic Products - 6.0%	Fines - 5.2%
Other Plastic Products - 5.3%	Demolition/Renovation/ Construction [1] - 5.5%	Demolition/Renovation/ Construction [1] - 4.8%
Yard Waste - 4.6%	Textiles and Leather - 4.9%	Other Film Plastic [2] - 4.8%
Textiles and Leather - 4.1%	Wood – Treated - 4.6%	Textiles and Leather - 4.2%
Wood – Treated - 3.8%	Newsprint - 4.0%	Wood – Treated - 3.6%
Cumulative – 61.7%	**Cumulative – 64.2%**	**Cumulative – 65.0%**

[1] The 2005 material Demolition/Renovation/Construction has been split into Asphalt Pavement, Brick, Rock, and Concrete; Asphalt Roofing; Drywall/Gypsum Board; Carpet and Carpet Padding; and Other C&D in 2011.

[2] The 2005 material Film/Wrap/Bags has been split into Retail Shopping Bags and Other Film Plastic in 2011.

Commented [17]: Could this be re-screen shotted without the "Table 4-2" on it, then we can call it Table A1. Comparison of Top 10 Most Prevalent Materials in MSW Stream. Retrieved from: Insert URL. Then the next table could have the same thing done, and just called Table A2.

Table A2. Comparison of Top 10 Most Prevalent Materials in Residential Stream, (Iowa DNR, 2011). Retrieved from: http://www.iowadnr.gov/Portals/idnr/uploads/waste/wastecharacterization2011.pdf.

Material 2011	Material 2005	Material 1998
Food Waste - 13.6%	Food Waste - 11.2%	Food Waste - 10.8%
Yard Waste - 7.8%	Mixed Recyclable Paper - 7.9%	Non-Recyclable Paper - 9.6%
Compostable Paper - 6.2%	Newsprint - 5.7%	Mixed Recyclable Paper - 6.1%
Textiles and Leather - 5.9%	Textiles and Leather - 5.4%	Fines - 5.8%
Other Film Plastic [2] - 5.8%	Demolition/Renovation/ Construction [1] - 5.4%	Textiles and Leather - 5.5%
Other Plastic Products - 5.2%	Film/Wrap/Bags [2] - 5.3%	Wood – Treated - 5.0%
Demolition/Renovation/ Construction [1] - 5.0%	Other Plastic Products - 5.0%	Other Ferrous Scrap Metals - 4.6%
Wood - Treated - 4.5%	Wood – Treated - 4.9%	Other Plastic Products - 4.4%
Other Plastic Products - 4.5%%	Diapers - 4.1%	Newsprint - 4.2%
Mixed Recyclable Paper - 4.5%	Other Inorganic - 3.9%	OCC and Kraft Paper - 4.1%
Cumulative - 60.7%	**Cumulative - 58.8%**	**Cumulative - 60.1%**

[1] The 2005 material Demolition/Renovation/Construction has been split into Asphalt Pavement, Brick, Rock, and Concrete; Asphalt Roofing; Drywall/Gypsum Board; Carpet and Carpet Padding; and Other C&D in 2011.

[2] The 2005 material Film/Wrap/Bags has been split into Retail Shopping Bags and Other Film Plastic in 2011.

Appendix B

Educational Material on Food Waste from the City of Dubuque

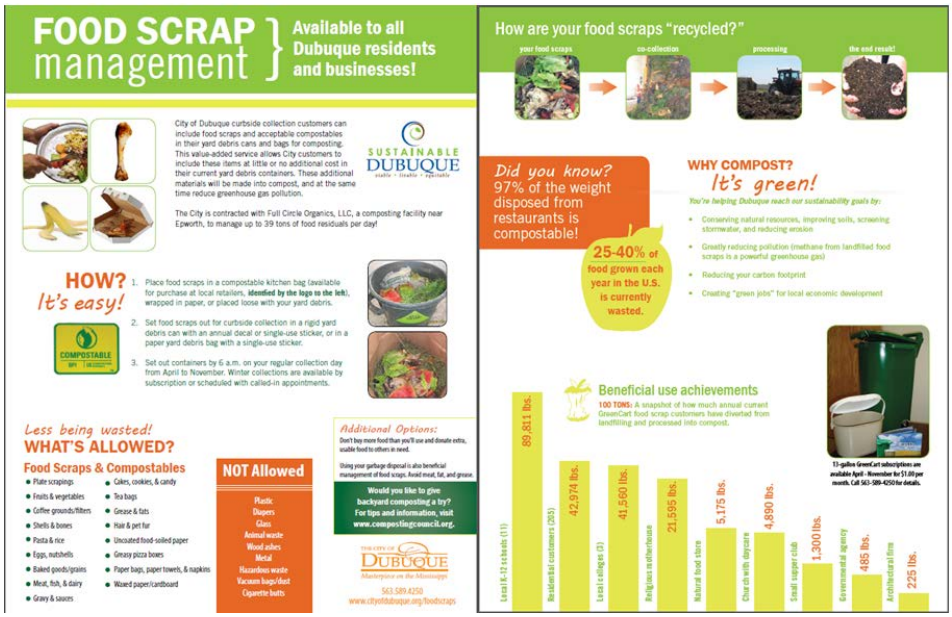

Figure B1. Food Scrap Management educational information that the City of Dubuque has available for its residents and businesses free of charge, (City of Dubuque). Adapted from *Food Scrap Management* by The City of Dubuque.

Retrieved from: http://cityofdubuque.org/DocumentCenter/View/17088

Appendix C

Food Waste Educational Material provided by Iowa City for its residents

Commented [18]: Not sure if that's true, that's just the gist I got from reading that section

Figure C1. Smart Strategy: Make a Shopping List with Meals in Mind, (City of Iowa City, Iowa, 2012). Adapted from *Smart Shopping: By What You Need* by The City of Iowa City, 2012. Retrieved from: http://www.icgov.org/site/CMSv2/file/solidWaste/MealsinMindSheet.pdf.

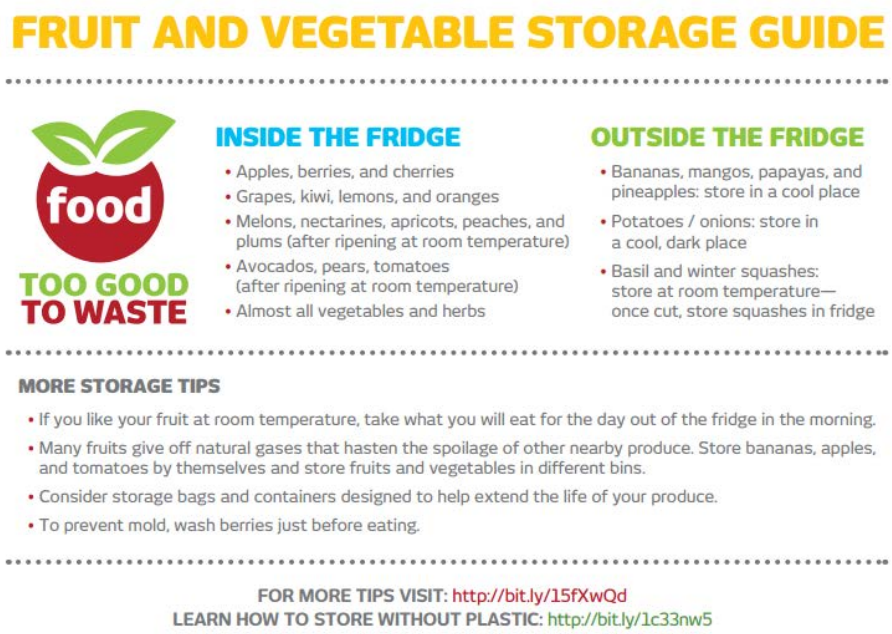

Figure C2. Fruit and Vegetable Storage Guide. Another example of educational material provided by Iowa City, (City of Iowa City, Iowa, 2012). Adapted from *Smart Storage: Keep Fruits and Vegetables Fresh* by the City of Iowa City.

Retrieved from: http://www.icgov.org/site/CMSv2/file/solidWaste/FruitandVegetableStorageGuide.pdf

TAKE THE CHALLENGE:

KEEP GOOD FOOD FROM GOING TO WASTE

food
TOO GOOD TO WASTE

WHAT IS THE CHALLENGE?

Did you know that, on average, American households throw out more than a quarter of their food purchases? Research shows that nearly everyone wastes more than they think they do. The Food: Too Good to Waste Challenge will help you figure out how much food is really going to waste in your home and what you can do to waste less. By making small shifts in how you shop for, prepare, and store food, you can save time and money, and keep the valuable resources used to produce and distribute food from going to waste!

GET SMART: SEE HOW MUCH FOOD (AND MONEY!) YOU ARE REALLY THROWING AWAY

WEEKS 1 & 2: Measure how much food your family wastes in a week and record the volume.

WEEKS 3 through 5: Try out one or more of the smart strategies listed below while continuing to measure how much goes to waste each week. Keep notes on what works to reduce food waste and what doesn't.

- **Smart Shopping: Buy What You Need** – Make a shopping list with the Meals-In-Mind Shopping List template based on how many meals you expect to eat at home before your next shopping trip. By buying no more than what you expect to use, you will be more likely to use it up and keep it fresh.
- **Smart Storage: Keep Fruits and Vegetables Fresh** – Store produce so it stays fresh longer with the help of the Fruits and Vegetable Storage Guide.
- **Smart Prep: Prep Now, Eat Later** – By preparing perishable foods as soon as possible, preferably post-shopping, you'll make it easier to serve snacks and meals later in the week, saving time, effort and money.
- **Smart Saving: Eat What You Buy** – This involves being mindful of leftovers and old ingredients that need using up. The "Eat Me First" prompt can be used to designate an area in your refrigerator for leftovers and food that won't keep long.

Week 6: Measure and record your final weekly food waste amount. See how much food (and money) you saved compared to weeks one and two.

Figure C3. Take The Challenge: Keep Good Food From Going To Waste. This is a challenge from Iowa City that attempts to educate residents while helping them become active in reducing their waste. Adapted from *Food: Too Good to Waste this was retrieved from* the *City of Iowa City, Iowa, 2012.*

Retrieved from: http://www.icgov.org/?id=2376.

Appendix D

Survey Questions

Thank you for participating in our ~5 minute survey on food consumption and waste. The USDA's Economic Research Service defines food waste as *the amount of edible food, post-harvest, that is available for human consumption but is not consumed for any reason.* Much of this waste occurs at the consumer level, where food is discarded after purchase for reasons such as overbuying and improper food storage. The purpose of this survey is to understand the opinion on the food waste climate in the Des Moines area, and determine the need for education on the subject. By clicking the "Next" button, you agree your answers will be used in research being conducted by Drake University Masters of Public Administration students.

1) Do you feel that there is a problem surrounding food waste?
    a) Yes
    b) No
2) What percentage of food waste do you think occupies landfills in Iowa?
    a) None
    b) 1-5%
    c) 6-10%
    d) 11-15%
    e) 16-20%
    f) 21-30%
    g) > 30%

3) On average, how much food do you think you throw in the garbage on a weekly basis? (1 Packaged item can be defined as one singular item, for example one container of pudding that would come in a 12 pack is 1 item, but half a bag of carrots is half an item.
    a) I don't throw away any food
    b) 1-5 Individually packaged items
    c) 6-10 Individually packaged items
    d) 11-15 Individually packaged items
    e) > 15 Individually packaged items
4) On average, what type of food product do you dispose of most? (Mark all that apply)
    a) Bread
    b) Dairy
    c) Produce
    d) Meat
    e) Drinks
    f) Leftovers
    g) Other (please specify)
5) On average, how much food do you put in the compost on a weekly basis?
    a) I don't know what a compost is
    b) I don't compost
    c) 1-5 Individually packaged items
    d) 6-10 Individually packaged items
    e) 11-15 Individually packaged items

f) > 15 Individually packaged items

6) Do you feel that you often buy more than needed when grocery shopping?

a) Yes

b) No

7) Does your family budget the amount of money you will spend on groceries?

a) Yes

b) No

8) What is the main reason why you might throw food away? (Mark all that apply)

a) It has become rotten

b) It looks weird

c) It smells weird

d) The Use By date has passed

e) The Use By date is near

f) I bought more than I needed

g) I prepared too much

h) I needed space

i) Other (please specify)

9) When you prepare too much food and throw some out, what is the main reason in doing so?

a) It didn't taste good

b) It wasn't possible to save the leftovers

c) I didn't want to save the leftovers

d) I saved the leftovers but they went bad after a few days

e) Other (please specify)

10) Which of the following would you be interested in gaining more information on?

a) Proper food storage

b) Use of distressed (i.e. ugly) food

c) Staying within your budget

d) Determining shopping needs

e) Meal planning

f) Cooking with what you have

g) Understanding use-by and sell-by dates

11) What store do you get the majority of your food from?

a) HyVee

b) Dahl's

c) Target

d) WalMart

e) Whole Foods

f) Trader Joes

g) Fareway

h) Coops

i) Community Supported Agriculture (CSA)

j) Other (please specify)

12) How much would you be willing to pay for a food scraps composting service (similar to a recycling or garbage service) if it were available through waste management services?

a) I would not be willing to pay for this service

b) $1 - $4.99 per month

c) $5 - $9.99 per month

d) $10 - $14.99 per month

e) ≥ $15 per month

13) Have you ever participated in a food waste educational program?

a) Yes

b) No

14) Would you participate in a food waste educational program if it were available?

a) Yes

b) No

c) Not sure

Food waste also occurs at the commercial level, where edible food is discarded for various reasons such as appearance or the sell-by date has passed.

15) Would you have a positive impression of a grocery store or restaurant if they donated these types of food to non-profit organizations that feed the hungry?

a) Yes

b) No

16) Would you shop or eat at these establishments over their competitors for this reason?

a) Yes

b) No

17) What type of residence do you live in?

a) Apartment

b) Condominium

c) Town-home

d) Single family home

e) Farm

f) I prefer not to say

g) Other (please specify)

18) In which Des Moines Metro community do you reside?

a) Des Moines

b) Windsor Heights

c) West Des Moines

d) Waukee

e) Grimes

f) Urbandale

g) Johnston

h) Ankeny

i) Altoona

j) Pleasent Hill

k) I prefer not to say

l) Other (please specify)

19) How many people live in your place of residence (including children or roommates)?

a) 1

b) 2

c) 3

d) 4

e) 5

f) ≥ 6

g) I prefer not to say

20) What gender do you identify with?

a) Male

b) Female

c) I prefer not to say

d) Other (please specify)

21) What is your age (please skip if you prefer not to answer)?

a) Open Entry

22) What is your employment status? (Mark all that apply)

a) Full time job

b) Part time job

c) Full time student

d) Part time student

e) Unemployed

f) I prefer not to say

g) Other (please specify)

23) What is your highest level of education?

a) GED

b) High school

c) Some college

d) Associate's degree

e) Bachelor's degree

f) Master's

g) Doctorate

h) I prefer not to say

i) Other (please specify)

We thank you for your time spent taking this survey.

Your response has been recorded.

Appendix E

Proposal

The USDA's Economic Research Service (ERS) defines food loss (waste) as the amount of edible food postharvest that is available for human consumption but is not consumed for any reason. The United Nation's Food and Agriculture Organization (FAO) predicts that approximately 40% of food in U.S. goes to waste. Of that, the ERS estimates about 31% of the food available for consumption at the retail and consumer levels went uneaten. Although some loss is inevitable, much of it can be prevented or recovered for human consumption. With 1 in 8 people struggling with hunger in Iowa, and 1 in 6 people struggling with hunger in the U.S., it is important to look into strategies to decrease food waste, and put food into the hands of those who need it.

Next Course is a Drake University student group, an official chapter of the Food Recovery Network, which fights food waste and hunger by recovering perishable food that would otherwise go to waste and donating it to people in need. Next Course is looking to create a partnership and develop a plan to implement a food recovery program with your organization. We believe this partnership would benefit your organization and help provide food to people who need it.

This proposed project would contribute to the mission of your organization and help fight hunger in the Des Moines metro area. There are a number of federal laws in place to help encourage food donation in the U.S. and provide an added benefit to your organization. The Bill Emerson Good Samaritan Food Donation Act provides liability protection to food donors who donate food and grocery products in good faith to qualified nonprofit organizations. In addition, the Internal Revenue Code 170(e)(3) provides enhanced tax deductions to businesses to encourage donations of fit and wholesome food to qualified nonprofit organizations serving the poor and needy. Donors are able to deduct the cost to produce the food and half the difference between the cost and full fair market value of the donated food.

Next Course has been working with Sodexo, the food service provider for Drake University's dining facilities, and has already rescued over 3400 lbs. of food from Drake's Hubbell Dining, catering events on campus, tailgating, and special events. They have donated to multiple nonprofit organizations in Des Moines including Hope Ministries Bethel Mission and Central Iowa Shelter Services, providing over 2,833 meals to those in need. With a great foundation in place, Next Course would be able to provide pickup and delivery service for any food your organization is able to donate, which would otherwise go to waste. The USDA ERS estimates that for every 1.2 lbs. of food rescued, 1 meal is provided to someone who needs it. With approximately 389,730 Iowans considered food insecure, your organization could help us move toward eliminating hunger within the Des Moines metro.

Although the focus of this partnership is to divert food to those who need it, rather than it becoming waste, we would also like to help you reach out to your customers to provide valuable information on food waste. This information would help educate consumers on food waste impacts and reduction strategies, to contribute to sustainability of the food system. We

believe that by providing information to your consumers on shopping strategies, expiration dates, and distressed produce use, they would develop a deeper connection to food, as well as a deeper connection to your organization.

We believe a partnership with your organization would contribute greatly to reducing food waste in Des Moines and building a better relationship with your customers. By donating food through Next Course, we would not only reduce the amount of food going to waste in your organization, but you would be directly helping out those in need in your community. We hope you will consider working with Next Course, as this partnership will make a significant impact in the Des Moines metro area. Please contact Laura Leben at the number listed below with any questions, and to set up this partnership with Next Course.

For more information on Next Course, please visit our website at https://nextcoursefrn.wordpress.com/category/about/next-course/.

Thank you for your time, and we look forward to working with you to reduce food waste in the Des Moines metro.

Laura Leben
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(630)450-0107
https://www.facebook.com/drakenextcoursefrn
http://nextcoursefrn.wordpress.com/
Twitter: @nextcoursefrn

Appendix F

Organization of Food Waste Reduction Workshop Conducted in Des Moines

Iowa Food Waste Reduction Project
Regional Workshop – Des Moines
Wednesday, October 30th, 2013

Des Moines Public Library
1000 Grand Avenue
Des Moines, IA 50309

AGENDA

9:30-10:00 Registration and Networking

10:00-10:30 Food Waste: A Multi-Faceted Problem

Dan Nickey, Associate Director - Iowa Waste Reduction Center, University of Northern Iowa

10:30-11:00 Eating Greater in Des Moines – Share the Love

Aubrey Martinez, Director, Eat Greater Des Moines Food System Council

11:00-11:10 Break

11:10-12:30 Panel - Identifying the Challenges to Food Waste Reduction and Diversion

Scott Amendt, GreenRU
Shelly Codner, Iowa Waste Exchange
Aubrey Martinez, Eat Greater Des Moines Food System Council
Sara Kurovski, Metro Waste Authority
Amy Buckendahl, Iowa Department of Natural Resources
Jim Grant, Wellmark Inc.
Alan Ceschin, Saniwax
Lynn Wilson, UnityPoint Health

12:30-1:30 Lunch and Networking

1:30-2:15 Innovative Resources from the Iowa Waste Exchange

Shelly Codner, Area 2 Representation-Iowa Waste Exchange

2:15-2:35 Overview of the Iowa Food Waste Reduction Website

Jenny Trent, Waste Reduction Specialist – Iowa Waste Reduction Center, University of Northern Iowa

2:35-2:50 Break

2:50-3:50 Interactive Session

3:50-4:00 Evaluations and Closing

Register at foodwaste.iwrc.org

Figure F1. Schedule for Iowa Food Waste Reduction Project Regional Workshop - Des Moines, (Trent. J., IWRC. Personal communication, February 11, 2015).

Appendix G

Brochure on the Meaning of Use-By/Sell-By Dates and Proper Food Storage

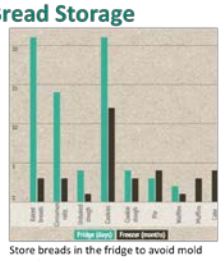
What is Food/Product Dating?

According to the Food and Drug Administration, Infant formula products are the only consumer good that is required to have product dating by Federal regulations. Since food dating is not regulated there is not a universally accepted systems for food dating in the US. There are roughly around 20 states that do have regulations in place for food dating. Food dating does not always relate to safety dates but rather date of best quality of product.

Types of Food Dates:

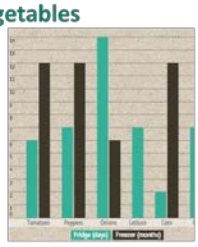
- **A "Sell-By" date** are a reference to distruster on how long to show a product for sale. Customers should purchase a product before this date.
- **A "Best if Used By (or before)"** date is suggested for best quality. It does not take into consideration purchase or safety of product.
- **A "Use-By" date** is the last date recommended for the use of the product while at peak quality. The date has been determined by the manufacturer of the product

Bread Storage



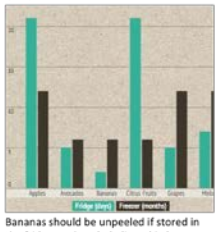
- Store breads in the fridge to avoid mold growth
- Flour can last for 8 months in an air tight container in the fridge, and 12 months in the freezer
- It is not necessary to store muffins or cake in the fridge unless they can't be used within 4-5 days.

Vegetables



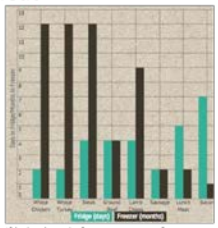
- Store lettuce in the bag from the store

Fruit



- Bananas should be unpeeled if stored in the fridge, and peeled, dipped in lemon juice, and stored in a freezer bag when stored in the freezer.

Meat



- If being kept in freezer, remove from grocery packaging and place in a freezer bag.
- Quickly place all leftovers in fridge, and then use as soon as possible.

Figure G1. The Educational Brochure we developed for use by Eat Greater Des Moines, Next Course, or the IWRC.